THE CHEMICAL AGE

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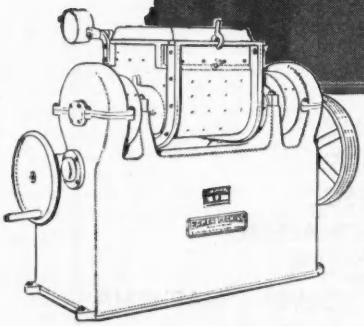

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Where Does Life Begin?

TO those engaged in the biological industries, the study of the smallest forms of life is commonplace. To many chemists who are used to inorganic chemistry or to the more mundane types of organic chemistry, there is an interest in biological chemistry that savours of the romance with which science is regarded by those who have the instinct for research, but lack the qualifications. Transcending all these subjects is that of the basis of life; where and how does the purely material end and matter containing life begin?

There are molecules that can be stated without doubt to be without life: sulphuric acid, benzole, anthracene, and going up the scale of atomic weight, the resins, and even those "vast" molecules of which plastics are composed. There are yet other molecules, or rather collections of molecules, which are obviously endowed with life. The smallest of these can be seen within our high-powered microscopes and, being too large to possess a brownian motion, yet move and are declared to have life, and on treatment with certain reagents they cease to move and are dead. On what ground are we sure that the smaller bacteria possess life? May not the action of the chemical reagent be to change the molecules so that they possess different properties?

These philosophical reflections, which may well excite the ridicule of the biochemist, have been engendered by reading the Cantor lectures on Enzymes delivered to the Royal Society of Arts, by Dr. J. A. V. Butler, and an article in a recent issue of *The Countryman*, "The World of the Infinitely Smaller," by Kenneth M. Smith, F.R.S.

Enzymes, these curious biological agents that bring about chemical changes in living matter outside the cell, were completely obscure until a very few years ago. During the past 20 years there has been an extraordinary widening of information. Enzymes have been recognised as proteins, and to that fact has been due much of the success with which they have been pursued by the chemist.

Proteins are highly complex nitrogenous substances always found in living matter, the most characteristic of vital substances, and yet they have no life themselves—so far as we have been able to recognise. About their chemical composition it has been established that they are largely composed of amino-acids, but just how the amino-acids are arranged to build up the molecule yet remains to be discovered. What is known is that the molecular weights of enzymes vary between the 15,000 of ribonuclease, the 48,000 of insulin, to the 15,000,000 to 20,000,000 of tobacco mosaic virus.

The proof that a protein consists of definite molecules, all of the same composition, is highly important. Svedberg's work with the ultra-centrifuge leading to this discovery has been described by Dr. Butler as "perhaps the most significant physico-chemical work of our time in its implications and in the tremendous field it has opened up. It not only established the natural unit of the most important constituent of living matter," he goes on to say, "but it also showed that organised chemical structures exist in profusion, of a

On Other Pages

much larger magnitude than had previously been suspected."

Study of crystals and of the tobacco mosaic virus as a molecule of high molecular weight brings us to Kenneth Smith's description of the world of the infinitely small. Here, as Smith says, quoting Aristotle, we reach that shadowy boundary in which nature makes so gradual a transition from the inanimate to the animate kingdom that the boundary lines between them are indistinct and doubtful. All virus particles are regarded as being alive.

Yet Smith can write: "Since the particles of many viruses are all of the same size and shape, it is legitimate to look upon them as molecules." Furthermore, he goes on to say: "Arising out of the isolation of viruses came the further discovery that several plant viruses could be obtained in pure crystalline form. Some were eight-sided and others twelve-sided, while others again formed thin crystalline plates. Just recently these thin virus crystals have been photographed under the electron microscope and . . . it is possible to see the actual arrangement of the virus particles in the crystal lattice. Thus, for the first time in history, we can see a molecule."

Are viruses alive? It may be that they are not. Scientists are undecided, although the modern trend is to regard them as living entities. This clearly is the province of the biochemist, but we are entitled to note a curious chemical property of certain very much larger aggregations of molecules that undoubtedly have life. The discovery of the sulphonamides opened up to science a whole class of substances, themselves undoubtedly inanimate, that can inhibit bacterial growth. Of this Dr. Butler says: "The reason for this inhibition was very obscure for a time; but a clue was found in the observation of Woods (1940) that p-amino-benzoic acid was antagonistic to this inhibitory action. The presence of a little amino-benboic acid prevents inhibition by sulphonamides. Now amino-benzoic acid is essential to the growth of many organisms. . . . Sulphanilamide, the simplest of these compounds, is a very close chemical analogue of p-amino-benzoic acid, having the sulphonamide group—SO_2NH_2—instead of the ordinary acidic group—COOH. Woods's theory was that the sulphanilamide impersonates the necessary amino-benzoic acid. It combines with the proteins or enzymes and co-enzymes of which the latter is the necessary constituent, but the enzyme containing the 'false' constituent is unable to carry out its functions properly; it is 'warped' and no longer makes a good fit with its substrate."

This analogy between chemical reactions and the mechanism of living things appears to have some extraordinary implications. We may be as far as ever from discovering why one minute aggregation of molecules is "alive" and another is inanimate. But at least we seem to have discovered a curious kind of no man's land in which the two can co-exist as molecules of constant composition of similar sizes. That no man's land may be the viruses. Scientific opinion suggests to-day that some viruses are alive and some are inanimate. We may be on the borderland of knowledge of what constitutes life.

NOTES AND COMMENTS

Scientists' Roll-Call

THE deep waters in which officialdom generally flounders in pursuit of its fundamental ideal of reducing the human element to a string of classified statistics are called to mind by the current attempt by the Technical and Scientific Register of the Ministry of Labour to count and sort into neat bundles this country's scientific manpower. In a spirit of optimism, which will not be widely shared, the Register is now broadcasting through a variety of channels a foolscap questionnaire of 14 parts in anticipation that scientists will identify and docket themselves, so that future requirements of scientific manpower, with which the Barlow Committee was lately so deeply engrossed, may be estimated with some accuracy. Something of this kind was of course inevitable if the "output" of scientists is to be regulated as are some more tractable materials. Our own view is that it cannot, but as there are manifestly not sufficient scientists for the needs of industry alone the Register is deserving of sympathy in the present Herculean undertaking which it has imposed on itself. In spite of Mr. Godfrey Ince's assurance on behalf of the Ministry, in a persuasive covering letter to scientists at large, "that the information that you provide will be treated in strict confidence and will not in any circumstances be used as a basis of any form of administrative control or direction . . .," we suspect the response will be no more enthusiastic than men of science generally accord to requests for potted biographies.

Mineral Wealth

NOW that the existence of a state of economic emergency is admitted in Government circles, as well as by more realistic sections of the community, the need for counting our resources has taken on special urgency. Two circumstances in our favour are that in the prosperous years relatively little use was made of substantial stores of indigenous materials and that Britain is better served than any other country in the matter of surveys. A timely and welcome reminder are the rather surprising revelations by the Geographical Survey Board of the scale on which British mineral resources are now being exploited. In the past, British minerals has usually been taken to mean coal. Actually, of course, the term embraces a wide range of basic materials whose value became abundantly apparent when the enemy blockade halted the accustomed influx from overseas. Now that the blockade is of the dollar variety the need is not less urgent and the work which the Geological Survey did in war should bear a second and continuing dividend. The fundamental importance of such work as the Survey Board's intensive study of the North Pennine orefield, to which reference is made in the newly issued 1945 Report (H.M.S.O., 9d. net), is proved by the successful exploitation of new sources of barytes. During the war the home production of barium minerals rose, as a result, by approximately 30 per cent—to 100,000 tons of barytes annually, of which the North Pennine field contributed nearly one-half. Another important contribution, of which the Survey Board was the instigator, had its genesis in a sampling campaign for zinc ore in the waste dumps in the Alston area, which resulted in the erection of a treatment plant with capacity of 1000 tons a day, and produced an invaluable source of zinc concentrates. These are but two instances of a long record of realistic enterprises which the Survey Board has carried out in support of the chemical and metal industries in time of need, which conferred, among other benefits, a plentiful supply of fluospar—basic requirement of the steel industry—from the North Pennines and Derbyshire, of potash feldspar and mica from Scotland and substantial supplies of bauxite from Northern Ireland.

International Red Tape

THE work of the Survey Board is representative of some of the more promising means of putting into the hands of industry the tools with which the overdue export job must be done. Yet another tool, it would seem, is equally urgently required just now—a keen edged tool in a determined hand to cut away the cocoon of red tape in which export traders, and chemical export traders more than most, are enmeshed. These are the documents commonly required to-day for the despatch of goods overseas: *Pro forma* invoice, im-

port licence, export licence, packing list, export declaration, shipping permit, dock receipts, bill of lading, special customs invoice form, insurance certificate, letter of credit and bank draft, manifest. Even when that formidable range of obstacles has been cleared there is, under present unpredictable conditions here and overseas, no certainty that a shipment will then have a straight run. "Even in one and the same country"—notes the International Chamber of Commerce—"regulations sometimes change with such rapidity that the customs officials themselves are unable to keep pace; opening and closing hours of customs houses are often not the same on both sides of the frontier." In the light of these and a host of similar booby traps to which the I.T.C. is calling attention some sympathy is due to the chemical export trader evincing lukewarm enthusiasm for the export campaign. Half these impediments to international exchanges are fundamentally unnecessary, and in the view of the I.T.C. all parties to overseas transactions would be adequately protected and administrative requirements fulfilled by three documents from the consignor: A bill of lading or consignment note, the commercial invoice and the packing list, with a manifest from the carrier by air or sea transport. The I.T.C. seems to have presented, without being asked, an opportunity for the International Trade Organisation to further its principal aim to everybody's benefit—excluding only the home and foreign armies of redundant government officials.

Guido Donegani

NOW that it is possible to see the principal figures in foreign chemical industry undistorted by the prejudices and propaganda of the war period, fresh estimations have to be made, in which the reputations of some ex-enemies are blackened still more by what is revealed, while the imposing stature of some others is now apparent for the first time in many years. To the latter category belonged Guido Donegani, whose achievements as father of the present-day Italian chemical industry and many ancillary activities the brief obituary notices published when he died paid inadequate recognition. Much of the picture has now been filled in (in *La Chim. e l'Ind.*, 1947, *29*, 133-136) by a colleague, Giacomo Fauser, who reveals the phenomenal drive and vision which permitted Donegani to build from the little mining firm of Montecatini di Val di Cecina, one of the world's leading chemical undertakings, upon which depended much of Italy's emergence from a nation of picturesque agriculturists, and much of the modern development of minerals and hydro-electric power. Fauser now gives something of the full story of Montecatini's impressive advance into most fields of chemical and allied industry: mining of copper, lead, zinc, iron, sulphur, marble, etc. nitrogen fixation and synthetics; calcium carbide and electrochemical industry, and chemicals based on carbide; aluminium and light alloys; dyes, intermediates, plastics. Donegani inevitably shared fully in the condemnation heaped on trusts and cartels, but, as Fauser remarks, it is self-evident that the greatest progress in chemical industry both in Italy and abroad has been made where it is concentrated in a few hands. Only a relatively small group, well organised and possessing ample financial resources can sustain the heavy cost of research and development. Donegani, it seems, was not the financial tycoon his critics would have one believe; he held barely 7 per cent of the shares of the Montecatini "empire." With characteristic courage, he stayed by his country to the last and his experiences as a prisoner of the Nazi SS after the Italian armistice hastened his end.

Chile's Copper Trade

Dollar Shortage Fears

COPPER, which has long been one of Chile's largest export items, is expected to make a considerable contribution to the country's foreign exchange during the current year. Almost the entire production is under the control of American companies and sales are effected in dollars. Although exports to the U.S.A. have been considerably reduced since the war, exports have been maintained at a relatively high level because of a resumption of trade with European countries. With regard to the future, however, the world shortage of dollars, if it continues, may adversely affect Chile's copper trade. For instance, during the past twelve months, the United Kingdom is understood to have purchased Chilean copper valued at £7 to £8 millions, payable in U.S. currency. These purchases, it is thought, will now cease owing to the shortage of dollar exchange.

New Chemical Laboratory for R.A.E.

Important Progress in Rocket Fuels

THE official opening of the new chemical and physical laboratory of the Royal Aircraft Establishment at Farnborough, manifests the great importance which the Government attaches to aviation research and development and in particular the leading rôle that chemistry will be called upon to play in its advancement. This was the substance of the address which Mr. G. R. Strauss, Minister of Supply, gave before a large audience of R.A.E. personnel and Press representatives in the conference room of the new building last week.

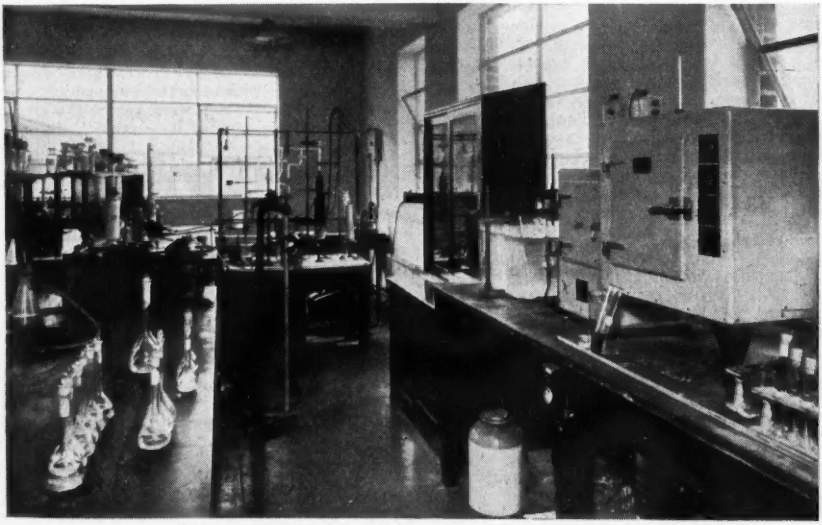
Proceedings commenced with an introductory speech by Dr. W. G. Perring, chief superintendent, who described the work of the Establishment since its inception in the years preceding World War I, when aviation was in its infancy. He paid tributes to valuable assistance rendered by Prof. Sir Ian Heilbron, in the early design stages of the project. Other well-known names mentioned in the same connection were Dr. J. O. Hughes (head of the chemistry department), Dr. Ramsbottom, and Prof. Wynne-Jones. Dr. Hughes later outlined much of the programme in hand, mentioning work in progress on plastics wings, new fuels for rocket motors, glues, fire prevention, toxicity of gases, etc.

Visitors subsequently broke up into small parties and toured the various laboratories at will.

Among the laboratories inspected were those concerned with rheology, lubrication, paints and dopes, plastics, wood and adhesives, rubber, radiography, gas analysis, crystallography, refrigeration and rocket fuels. A particularly interesting piece of apparatus in the last mentioned department is used for experiments with the use of methyl alcohol/80 per cent hydrogen peroxide for rocket fuels—as a demonstration showed. The two liquids ignite spontaneously upon coming together.

On the possibility of using higher concentrations of hydrogen peroxide, a technician informed THE CHEMICAL AGE that concentrations of up to 90 per cent could (with care) be safely handled at the moment, but that higher concentrations up to the 100 maximum required a technique which the establishment had yet to perfect.

Contained in a typically modern 3-storey building on a 4-acre site, away from the dust and much of the noise of the airfield, the laboratories are equipped with the latest scientific apparatus; floor space amounts to about 40,000 sq. ft. The general lay-out and appointments of the laboratories fully confirmed that Mr. Strauss's belief that "chemists can work best when they have comfortable surroundings" is to be implemented here.



Part of the plastics laboratory at Farnborough

GERMAN CHEMICAL REVIVAL?

NO LARGE-SCALE PRODUCTION BEFORE 1949

THE prospects of revival of German chemical industry and the re-establishment of part of the country's great pre-war activity in world markets are the subject of a detailed study, from the German viewpoint, in the *Hamburger Allgemeine Zeitung*. Nostalgically, it is recalled that, before the war, German industrial chemical undertakings led the world in spite of Anglo-American competition. Germany kept her dominating position throughout World War I and even during the slump of 1930-1933 increased her production and exports. Her share in the world trade rose from 26.1 per cent in 1929, to 28.3 per cent in 1933 and her dominance was maintained until the last war.

Past Achievements

Germany's share of the world export of ammonium sulphate, however, dropped from 40 per cent in 1929 to 19 per cent in 1937, but the share in the participation in the remunerative exports of dyestuffs, and of pharmaceutical and other organic chemical products, increased in the same period from 37 and 31 per cent to 41 and 37 per cent, respectively. These facts are recalled as a token of Germany's chemical industry's capacity gradually to recover again.

Meanwhile, the authorities have limited German production of chemical raw materials to 40 per cent of pre-war level, of dyestuffs, pharmaceuticals and artificial fibres to 80 per cent and of other chemical products to 70 per cent; these targets are very unlikely to be reached before 1949 on account of the great war destruction. And exports of chemical products will be reduced even more severely than production. The Allied economic plan provides for no export at all of chemical raw materials and some finished and semi-finished products, including heavy chemicals and fertilisers, which before the war were of great importance.

Scope for Drugs

The export of dyestuffs, which before the war represented a value of Rm. 200 to 336 million, will be allowed only to reach the value of Rm.58 million, in the fixed ratio to the value of 1936, whereas the export of pharmaceutical products, also based upon the 1936 figure of Rm.125 million, is fixed at Rm.120 million. This apparent concession can be explained by the fact that the demand for German medicaments and specialities is still great and that, in spite of the confiscation of German patents, it is not generally practicable to exploit them abroad.

It is expected that the new industrial plan may fairly shortly permit the export of heavy and industrial chemicals which are at present scarce in England and the U.S.A.

German dyestuffs and pharmaceutical products, it is pointed out, are in steady demand everywhere, but the supply is very much hampered by the lack of overseas sales organisations and by the need of foreign currency or credits. The present division of Germany into four zones is also a great hindrance.

The 80 chemical works in the Soviet zone of Berlin are quite cut off from the world market. The importation of raw materials, such as boron, iodine, camphor, vegetable drugs and medicinal herbs all of which formerly came from abroad, is now impossible, and the materials upon which the production of ointments and plasters depends is mainly concentrated in Hamburg.

Exchange Requirements

The total of foreign exchange required, the *Hamburger Zeitung* points out, is, however, not very great. It formerly represented only 1 per cent of the proceeds of export transactions and would now be 2-3 per cent, on account of the general increase of prices of raw materials. An export value of Rm.120 million would thus require only Rm.3.6 million in foreign exchange. Double this amount would be necessary for imported raw materials for the home demand for pharmaceutical products. At present the great difficulty, says the *Zeitung*, is to procure sugar, alcohol, starch, ampoules and medicine bottles, which formerly came from places now in the Russian zone, and which are lacking in the Western zone, where the great pharmaceutical industry is located.

German Chemical Production.—The Chemical Works at Dessau have succeeded in stepping up production of ceresin to 120 tons a month and a further increase to 200 tons is planned. The same firm is endeavouring to produce sufficient quantities to allow interzonal trade in this commodity. The Hydrating Works at Rottleben, Soviet Zone, produces Lanette-wax and Ceticol-Extra as basic materials for ointments. The soap factory "Palmolive" Binder & Ketels G.m.b.H. at Hamburg-Billbrock, British Zone, have resumed production with half the number of their pre-war staff. The products will go to Hamburg and Schleswig-Holstein. The Alabaster-Gypsum Works at Cologne, also in the British zone, have again taken up the production of medical gypsum for hospitals, laboratories and dentists.

Appointments in Chemistry

50 Poles on Ministry's Register

THE Technical and Scientific Register, a wartime instrument set up by the Ministry of Labour and National Service to place qualified chemists, chemical engineers and others in suitable employment is still actively in existence, and contains the names of some 450-600 useful men between the ages of 25-65. This information was given to THE CHEMICAL AGE this week by a Ministry of Labour official in a personal interview.

There are two categories of applicants, viz., (1) Englishmen (about 450 in number) of from 40 to 65 years, mostly in employment but seeking better paid posts at salaries ranging upwards from £400 per annum (the figure, of course, depends upon qualifications); (2) Poles who have enrolled in the Resettlement Corps. These men, of whom there are about 50, varying in age from 32-40. Generally speaking, these candidates joined the Polish Forces immediately after graduating—they have had, in most cases, little or no industrial experience. They are asking for relatively small commencing salaries and agree to be treated as trainees.

It is emphasised that these Poles desire to remain in this country and will in most cases ultimately apply for British nationality.

Younger Men Preferred

The Ministry of Labour has stated, some difficulty is being experienced in placing these men in suitable employment. It appears that employers are seeking younger men just leaving universities and colleges. This is a policy which though possessing merits of economy, may have been occasioned from lack of knowledge of alternative sources of suitable personnel. At all events, here is a pool of labour that should help to ease the shortage of qualified chemists which may arise when the large scale plans for expansion of a number of chemical industries go into production.

Benzene Explosion Inquest

EVIDENCE that the explosion which occurred at the chemical works of Messrs. A. Boake Roberts & Co., Ltd., on October 17 (THE CHEMICAL AGE, October 25) could have been caused by a spark from a boot nail coming into contact with escaping benzene vapour, was given at the inquest on the three victims of the explosion on Tuesday.

The witness was Mr. F. Andrews, plant manager, who said he had no doubt that benzene vapour was escaping from three absorbers. He added that he was unable to suggest the actual point of ignition, and there was nothing to indicate the cause. Every precaution had been taken.

U.S. Lead Output Slumps

14 Per Cent Less in 1946

LEAD production from domestic mines in the U.S.A. dropped 14 per cent in 1946, and, for the first year on record, was exceeded by the smelter production of secondary lead, according to final figures just released by the Bureau of Mines, U.S. Department of the Interior. The supply of refined lead available for consumption continued to decline despite an advance in price to an unprecedented 12.55 cents per lb. at the year's end. Domestic mine production of lead and refinery output from domestic ores and base bullion declined to the lowest levels since 1935 and 1933, respectively.

Lowest Imports

Total output of refined lead at primary refineries fell 25 per cent to 346,200 tons, against 462,100 tons in 1945, and antimonial lead production decreased 11 per cent. Imports of lead-bearing materials urgently needed to offset the decreasing mine output dropped to the lowest level since 1939.

Among the factors said to have restricted production during the year were prolonged labour strikes and shortages and uncertainty regarding extension of price controls and ceiling prices; and the consequent unstable price structure during the month when the Office of Price Administration was inoperative. Ceiling prices on virtually all commodities, including lead, were removed in November.

Lead continued under Government control during most of 1946 through provision of Civilian Production Administration General Preference Order M-38, prohibiting the use of lead for certain purposes. This Order was revoked, at the instance of the great majority of the lead producing and consuming industries, on December 27, 1946, thus virtually ending the Governmental control of lead which began in October, 1941. Subsidy payments under the Premium Price Plan for over-quota production remained in force through June but collapsed with the expiration of OPA and ceiling prices.

Consumption and Imports

A survey of 575 plants in 1946 representing an estimated 98 per cent of the consumers indicated a total consumption of 520,525 short tons of refined lead, a decrease of 18 per cent from 1945. Of the total, 25 per cent was used for making red lead and litharge.

Imports during 1946 dropped to the lowest level since 1939 and were 68 per cent below the record total of 1942. Forty-eight per cent of the pigs and bars came from Mexico and virtually all the remainder from Canada, Peru, Japan and Australia. Receipts of lead in ore and matte, which constituted 28 per cent of the total imports, were 37 per cent below the 1945 level.

WORLD TIN ALLOCATIONS ANNOUNCED

This Year's Final Distribution by Countries

THE Ministry of Supply announces that the Combined Tin Committee has made the final allocation of tin metal for the second half 1947, amounting to 11,085 long tons. This allocation is in addition to that of 11,331 tons announced July 8, 15,710 tons announced August 21, and approved since the last formal meeting of the committee. (THE CHEMICAL AGE, July 12, August 30, and October 4.) Total allocations to date amount to 38,857 tons. For most countries, the allocations shown below will be final for the second half of 1947. Certain countries, however, may receive additional grants in the near future.

Improved Supplies

Present allocations are somewhat higher than had been predicted in August owing to a moderate increase in quantities available for export from the producing countries. Except for a small reserve to cover the revised allocations noted above, all visible supplies for the half year have now been allocated. Although the rate of production of tin metal is increasing, says the Ministry, the total new supplies still fall considerably short of requirements.

FINAL TIN ALLOCATIONS

Country	Previously approved	New	Total
Argentina	—	75	75
Australia	425	100	525
Austria	97	51	148
Brazil	100	—	100
Canada	1,000	525	1,525
Ceylon	26	22	48
Chile	49	—	49
Czechoslovakia ...	508	224	732
Denmark	165	60	225
Egypt	110	40	150
Finland	72	31	103
France	4,115	1,210	5,325
Germany	1	99	100
Hong Kong	52	61	113
Hungary	203	—	203
India	3,263	651	3,914
Ireland	25	5	30
Italy	657	—	657
Newfoundland ...	5	—	5
New Zealand	296	80	376
Norway	141	51	192
Palestine	82	31	113
Philippines	4	14	18
Poland	241	197	438
Sweden	493	200	693
Switzerland	522	—	522
Turkey	186	74	260
U.S.A.	14,657	7,143	21,800
Uruguay	41	4	45
Yugoslavia	116	57	173
Other South American and Middle East Countries	120	80	200
Totals ...	27,772	11,085	38,857

Sources of supply are as follows: The United Kingdom (on behalf of Malaya), Hong Kong, the Netherlands, Belgium, China, Siam, and the United States (for Japanese tin). In addition, small demands of certain Latin American and Middle-Eastern countries may be met from British, Belgium, Netherlands and United States sources.

The Ministry also states that the Combined Tin Committee has decided not to make allocations to individual countries within the block tonnage allocated to "Other South American and Middle East countries."

U.K. Stocks

Figures issued by the Ministry of Supply relating to the U.K. tin position for September, show that stocks of tin metal held by the Ministry and consumers at September 1 amounted to 9700 (long) tons, or nearly 500 tons more than on August 1. Consumption during September also rose to 2376 tons compared with 1674 tons during August. Stocks at the end of September were: Ministry, 6387 tons; consumers, 3082 tons. Stocks of tin ore fell during the month from 7434 tons to 6038 tons.

Over Half for U.S.A.

A consideration of the final world allocations reveals that allocations to the U.S.A. amount to well over half the quantities of tin available. It has been suggested unofficially, that the U.S.A. is stockpiling, regardless of the conditions of acute world shortage. An additional factor to be considered is that the U.S.A. is not possessed of substantial tin ore deposits. In 1944, for example, only 5.4 long tons were produced in the 8 tin-ore producing states, viz., South Dakota, Alaska, Montana, New Mexico, Alabama, California, Nevada, and North Carolina. Output from U.S. tin smelters in 1944 amounted to 30,884 long tons, a figure which suggests that peacetime consumption of tin is either considerably higher than that in wartime (which seems unlikely) or stocks are being increased as insurance against some future emergency or a continued shortage.

If it is accepted that the U.S.A. will take all the tin she can get, it seems unlikely that the elimination of American tin subsidies, associated with current tariff arrangements, will greatly benefit Malayan producers—particularly during the current world scarcity. The full text of the tariff agreement will be published on November 18.

PRINCIPLES OF PRESSURE SPRAY NOZZLES—III

Viscosity and Nozzle Capacity

by H. L. M. LARCOMBE

IF we take the term "capacity" of a nozzle to indicate the volume of liquid passed, then the actual viscosity of a fluid does not affect the capacity of a nozzle quite so much as it affects the spray form and the droplet-creating quality of the nozzle. To maintain capacity with a more viscous liquid than water will require a higher pressure at the nozzle, but this pressure will be found to be not quite so great as it would first appear. This will depend to some extent on the construction of the nozzle.

First, if the nozzle is of a design which has small dimension passages in its construction, such as the Merrell-Soule nozzle (U.S. Pat. No. 1,183,393), the passages are actually part of the liquid path and will offer more resistance to the flow of a high viscosity liquid than a low viscosity one.

Second, if a nozzle has a spin-chamber where the liquid is given swirl before passing through the orifice an increased pressure must be exerted to supply the additional energy to impart this turbulence to the more viscous fluid.

Where a nozzle has no internal passages but comprises a relatively thin orifice plate (Fig. 7) the additional pressure required for a highly viscous fluid is very small indeed, as the main loss is the exit loss which is not influenced by viscosity until certain conditions obtain which are usually not within the range of normal spray nozzle application.

Main Function of Nozzles

The function of emitting a volume of fluid is, however, not all that is required of a spray nozzle. The main function of a nozzle is to break down the fluid into droplets and it is this ability to form droplets that is affected by increased viscosity much more than its ability to pass a given volume of fluid.

It can be shown that at any given pressure the capacity of a nozzle determined when passing water is not very greatly reduced when a more viscous liquid is passed, but the quality of the spray deteriorates very noticeably; indeed, the issuing fluid may pass as a disturbed jet only and not rupture into droplets to any appreciable extent.

The question of additional pressure for a more viscous fluid is therefore usually not so much a matter of maintaining volume passed—"capacity"—as maintaining a useful spray form and a good drop size distribution. It is, therefore, good policy to ensure that fluids to be passed through a spray nozzle have a viscosity as low as possible, even to the extent of heating them before spraying.

In studying the question of nozzle design and its influence on the pressure-capacity-viscosity relationship it should first be clearly understood that the actual breaking down of the fluid into droplets does *not* usually take place inside the nozzle, but only after the initiating element, whether it be of the filament or thread type, has actually left the nozzle.

Effect of Increased Viscosity

Because of this any increase in viscosity will, to some degree, increase the pressure which has to be exerted because the whole of the orifice to the tip of the nozzle can be considered as part of the conduit through which the fluid has to pass. The simple orifice at the end of the supply line will, therefore, have least effect on the pressure, as the losses are much the same as with water. (The length of the orifice should be kept as short as possible compatible with wear.)

Although the author is aware of no actual tests on simple orifice spray nozzles carried out to determine the limit beyond which viscosity does affect the pressure, the formula given by the Foxboro Co. for flow meter orifices can be used as a check. These state that viscosity can be ignored until the following expression is proved to apply.[4, 5]

$$\frac{W_h}{d\ t_s\ G_f} \text{ is greater than } 2770$$

$$\frac{V^h}{d\ t_s}$$

W_h = Rate of flow in pounds/hour.
V_h = Rate of flow in gallons/hour.
d = Orifice diameter in inches.
t_s = 465 × kinematic viscosity in c.g.s. units.
G_f = Specific gravity of flowing liquid.

To understand the full effect of viscosity on the capacity of nozzles, other than a simple orifice at the end of the pipe, the influence of the degree of turbulence existing on the liquid before it leaves the orifice should be understood.

Turbulence is a measure of the Reynolds

Number of the flow and in this application has two main aspects.

(a) In highly turbulent flows the orifices have better drop-forming powers than with a less turbulent, more viscous flow. (Water with a high Reynolds Number and high turbulence gives a better spray quality than a highly viscous jet with a low Reynolds Number).

(b) The degree of turbulence is a measure of the viscosity of the fluid and a measure of the Reynolds Number, all other factors being constant, and also a measure of the friction loss and consequently the pressure required for a given flow quantity.

Importance of Turbulence

It will be seen, therefore, that the degree of turbulence in the orifice as indicated by the Reynolds Number is of importance from two points of view: of spray quality and also of maintenance of quantity of fluid passed.

Therefore, after allowing for surface tension, one simple way to maintain the quality of spray and the quantity passed when spraying a viscous fluid is to establish a similar dimensionless number to Reynolds Number for the water flow through the nozzle and find what pressure is required to establish a similar number using the higher viscosity.

As the dimension factor in Reynolds Number is constant and, assuming the velocity through the nozzle to be the same for equal volumes, the figure required is a function of specific gravity and the absolute viscosity, *i.e.*, the kinematic viscosity.

However, as the flow is in the turbulent range of flow, the relationship between the friction factor and Reynolds Number does not follow a straight line law. A curve shown in Fig. 9 gives information which will prove of use in giving the factor which can be used to find the variation in pressure required for various viscosities.

Nozzle Designs

The centre jet type of nozzle gives a solid cone spray form with fairly uniform distribution over the entire area covered. The section view in Fig. 1 showed the action inside the nozzle. The major portion of the stream passes through the annulus vanes and is given a rapid swirling motion. The remainder of the liquid passes straight through the centre jet and impinges on the liquid mass just upstream of the orifice, causing the liquid to issue from the orifice in a full cone spray. It gives a good spray at relatively low pressures.

The centre vaned portion is a press fit in the main nozzle shell which allows a good vane to be employed and also allows replacement when necessary. It can be manufactured in any metal or alloy, vulcanite or plastic. A nozzle similar to this is patented in the U.S.A. by the Spray Engineering Co.

The angle of the cone varies with orifice size and pressure. The apex angle of the cone for constant orifice size increases with increased pressure, reaching a maximum which is maintained constant even when pressure increases.

In certain cases the apex angle is reduced if pressure is increased after the desirable maximum is reached. This is due to an increase in the axial component of the flow relative to the rotary component. This variation in angle was shown in Fig. 4. Owing to the wide use of this nozzle in spray ponds the usual heights of the spray were also given in Fig. 4.

Spiral or Ramp Bottom Type

This type gives a hollow cone spray form and is especially suitable for water containing solid matter such as slurries and industrial waste effluents. This is a centrifugal nozzle which has an advantage over other nozzles of this type, inasmuch as it has no narrow internal passages which would become blocked by foreign matter. The spin chamber is large and the inlet to the chamber is approximately half the area of the pipe leading to the nozzle. Such nozzles can be manufactured in any metal or alloy, vulcanite or plastic. A nozzle of this design is marketed by Spray Engineering Co. in U.S.A. and by Ledworth & Becket in this country.

The angle of the cone increases with increased pressure to a maximum and then remains constant.

This gives a hollow cone spray form and

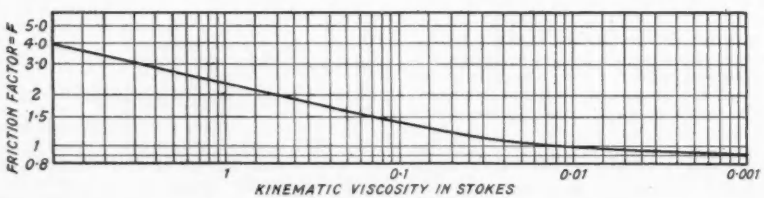


Fig. 9. Pressure required to maintain water capacity at increased viscosity = pressure for water × F

will give very consistent results. It will pass any material small enough to pass the inlet port and can be manufactured in any metal or alloy and can be used at very high nozzle pressures. The apex angle increases with increased pressure to a maximum and there remains constant.

This nozzle has an advantage that it can be manufactured at quite low cost and allows orifice replacement. The inlet port into the spin chamber should be equal to, and never less than, the orifice.

Flat Spray Type

This gives a flat fan shaped spray form and will operate with any material small enough to pass the orifice. The angle of the spray increases with increased pressure to a maximum and there remains constant. The drop size distribution of this nozzle is not consistent across the angle of the spray plane. The outer "horns" of the spray are a source of very large, probably recombined, drop but normally this spray is not used for applications which demand close droplet size control.

It is a very good nozzle for producing jets capable of doing physical work, cleansing or descaling.

The misting type is a low capacity nozzle which produces such small droplets that no definite spray form is evident. The droplets have little inertia and are immediately carried in the prevailing air current. The small orifice is usually drilled in a sapphire inserted in the tip of the nozzle. To prevent the orifice becoming clogged a fine gauze screen is mounted as an integral part of the nozzle. These nozzles can be used for many purposes which require low capacity and fine atomisation, such as applying perfume to cosmetics.

Conclusion

Perhaps the greatest unknown factor in spray nozzle design is the drop size distribution and how it is affected by nozzle construction and other variables. Any work which will advance our knowledge on this point will help to bridge a large gap in the work of applying spray nozzles efficiently. Such work would necessarily have to include work on recombination and coalescence.

Nozzle types as shown in Fig. 1, in order of suitability are: Cooling circulating water of condensers, 4, 1, 3; aerating water supplies, 4, 1, 3; spraying brine for refrigeration purposes, 4, 1; quenching coke and pig iron, 4; washing coal, sand and gravel, 4, 1; beating down foam in paper manufacture, 4, 5; chemical processes requiring large free area, 4; distributing oil over fuel beds in gas machines, 4, 2; manufacturing salt by spray evaporation, 4; enriching gas with liquid distillate, 1, 2; scrubbing and gas washing, 1, 2; humidification, 6, 1, 3; applying asphalt to roads, 1, 5; settling dust in ash pits, bins, etc., 1, 2; descaling hot steel billets, 5; cleansing wire screens and felts on paper machines, 5; cooling rubber mill rolls, 5; cleaning moulds, 5; washing rolling stock, 5, 4; applying anti-rust to metal sheets, 5; washing metals after pickling, 5; applying weed-killers on railway roadbeds, 5; spray drying, 1, 2, 4.

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(Concluded)

U.S. Mineral Reserves

Bureau of Mines' Wartime Activities

RESULTS of exploratory work conducted by the Bureau of Mines on mineral deposits in Wisconsin and Wyoming are described in two separate publications just released. The studies disclose valuable information on the U.S. mineral resources as well as materially assist the conservation of domestic supplies of essential metals. The two reports are entitled: Report of Investigations 4090, "Winskell-Andrews-Lyne Zinc Deposits, Lafayette County, Wis." and Report 4089, "Good Fortune Iron Mine, Platte County, Mo."

Copper Deposits

As a result of the U.S. Bureau of Mines' wartime investigation of an extensive Arizona deposit of ore containing 0.8 per cent copper, reserves of copper are now known to be larger than was previously thought. The San Manuel deposits in Pinal County have proved to contain large reserves. Drilling has indicated the existence of about 30 million tons of ore, and further drilling in the same area by private enterprise has increased this estimate 14-fold, and plans are under-way for immediate development. Although the San Manuel deposit was first located in 1870, little work was done on the property until 1916. Work was soon stopped, however, and was not resumed until the Bureau began its investigation in 1943. Plans are reported to have been drawn up to mine 25,000 tons of ore daily.

American Chemical Notebook

From Our New York Correspondent

A SCIENTIFIC mission is shortly to be set up at the U.S. Embassy in London, where it will direct the exchange of scientific information and personnel between the United States and Great Britain, and generally develop and maintain close contact with Government and other research institutions in the U.K. Leading the mission—of scientists and engineers—will be Prof. Earl A. Evans, Jnr., a 37-year-old American biochemist who is chairman of the department of biochemistry at the University of Chicago.

* * *

Two German methods for the production of chlorinated high molecular weight polyvinyl chloride resin, for adhesives, lacquers, fibres and other purposes are described in a report prepared by Clayton F. Reubensaal and just placed on sale by the U.S. Department of Commerce. The report (P.B. 77677) was prepared by Mr. Reubensaal following investigation and study of the processes used at the Bitterfeld and Rheinfelden plants of I.G. Farbenindustrie. Chlorinated polyvinyl chloride—"PC" to U.S. industry—retains much of its tensile strength up to 80°C., the report states, when used in the form of fibres. It is more crystalline than polyvinyl chloride and produces higher percentage increases in tensile strength when stretched. Though it deteriorates in strong sunlight, it is especially resistant to acids, alkalis, water, and fungus, and is also non-inflammable. These properties make it particularly suitable for use in filter cloth, rot-resistant fabrics, non-burning parachute cloth, industrial clothing, brush bristle, chemical ropes and fibres. For lacquers, some soluble types of chlorinated polyvinyl chloride are dissolved in trichloroethylene, ethylene dichloride, and mixtures of the lower alkyl acetate esters. Other solvents are used to prepare chemically resistant adhesives for general use. Inseparable bonds are obtained when methylene chloride solutions of PV are used as adhesives for plasticised polyvinyl chloride—shoe soles are an example.

* * *

Chlorinated polyvinyl chloride, however, does not lack some disadvantages. Two inherent objections against PC are its relatively low melting point and its instability in light and heat. The I.G. Farben researchers tried to overcome the low melting point problem by the chlorination of copolymers of vinyl chloride but the work was dropped because of the great expense. The problem of instability was partially overcome by the development of hydrogen chloride, dioxdiethyl sulphide, thiodiglycol, and other glyceral derivatives as stabilisers. Both the Bitterfeld and Rheinfelden plants used a solvent process for making chlorinated polyvinyl chloride but a suspension method was so successful that it was scheduled to become the method used for plant expansion.

* * *

The Ancelle plant of the Celanese Corporation of America, Cumberland, Maryland, is shipping celanese acetate to British Celanese, Ltd., to enable the British company to maintain production. This statement came from Mr. Fred T. Small, company vice-president and plant manager. Several tons, he said, had already been shipped, and no schedule for shipments has been drawn up, since the acetate is sent when shipping space is available. The shipments are being made as a result of a fire which damaged the British Celanese plant and curtailed the production of acetate. The acetate being shipped comes from inventory stock and is not hampering American production.

* * *

A new synthetic fibre, Saran fibre, derived from Saran plastic by the Dow Chemical Company, promises to become the most important synthetic textile raw material since the development of nylon. The Dow Chemical plastic has already been used with success in the manufacturing of such items as screening, upholstery and women's handbags and hats. Resistant to moisture, flame, rot and mildew, the plastic is now being spun into ultra-fine fibres which can be made into gossamer-sheer fabrics. One successful application of the new synthetic fibre has been its use by the Columbian Rope Company, Auburn, N.Y., for the manufacture of acid-resistant rope. The first fabrics that will be made from this synthetic material will go into the manufacture of draperies and upholstery and it is suggested that it will eventually find its way into clothing, blended with other fibres, both natural and synthetic. Saran absorbs less moisture than nylon and is regarded probably as being particularly well suited for raincoats. Although it will melt at high temperatures, it will not flame. Chemically called vinylidene chloride, Saran's raw materials are petroleum and chlorine gas. Because it contains so much low-cost chlorine, it is one of the cheapest of plastics and may eventually become one of the low-priced textile fibres. It will almost certainly be cheaper than nylon.

GELLING OF NITROCELLULOSE

Detailed Studies of Absorption Processes

IN a paper read at a meeting of the Centre de Perfectionnement Technique, Paris, Mlle. Thérèse Petitpas, D.Sc., describes recent work, including her own, on the gelling of nitrocellulose (*Chim. et Ind.*, 1947, *58* (7), 17-23). Among the cellulose esters, the nitrate is very convenient for study owing to the presence of the O-NO_2 group which, being extremely reactive, permits the use of various types of gelling agents.

First, J. Desmaroux in 1922-1930 studied the absorption by nitrocellulose of three types of gelatinisers: substituted ureas, camphor, and alkyl nitrates. (*Mém. Poudres*, **1923**, *20*, 70; **1928**, *23*, 54; **1930**, *24*, 86; **1930**, *24*, 211) and obtained two different absorption curves: with the nitrates he found absorption nearly uniform and the curve nearly approaches a straight line; but with camphor or the ureas the curve was irregular and discontinuous. These results formed the starting point for subsequent research.

X-Ray Studies

The work of Hess and co-workers is next considered, including results of X-ray structure examination, and the action of cyclohexanone on tri-acetyl cellulose. Other agents used were methanol-cyclohexanone mixture, camphor-methanol, and acetone. (*Z. phys. Chem.*, 1929, *5*, 161; 1930, *7*, 16-7), etc.

Although Hess published many papers on his X-ray studies, Dr. Peptitpas points out that there did not appear to be equilibrium between the fibre and the gelling medium. Structure was therefore examined in the solid phase, of which the composition was imperfectly known.

Desmaroux, with Mathieu, resumed work in this field (Gelling of nitrocellulose, *Actualités scientif*, Hermann, ed. 1936, Thèse, Paris, 1936; Thérèse Petitpas, *Mém. Serv. Chim. Etat*, 1943, Thèse, Paris, 1943). Gelling and solubility were investigated from the point of view of both structure and thermodynamics. X-ray studies of the latter have since been well defined and precise composition has been known. Calorimetric measurements have permitted precise observation of heat phenomena accompanying absorption (E. Calvet, *C.R. Acad. Sci.*, **1941**, *212*, 213; **1942**, *215*; **1943**, *217*); also birefrigent measurement (S. Perrier et M. Mathieu, *C.R. Acad. Sci.*, 1942, *214*) and study of mechanical properties (Madeleine Raisou et M. Mathieu, *loc. cit.*, 1941, *212*) have made it possible to define precisely the plastic phases obtained. Density measurements have assisted in the same direction.

Dr. Petitpas has therefore been led to classify gelling agents as (1) those which during absorption modify crystalline structure as revealed by X-ray study; and (2) those which do not modify structure. The first class include the ketones—acetone, cyclopentanone—alkyl acetates, and also camphor. To the second class belong alkyl nitrates.

Her experiments were made with well orientated nitroramie fibres to facilitate X-ray examination, and represented either dinitro- or trinitrocellulose. The fibres were submitted either to vapours from solutions of gelling agent in castor oil, or immersed in solutions of the agent in inert solvents.

It was not possible to use as variable in defining the system the degree of concentration of solution, as solution was not complete or perfect. Results, therefore, are expressed in terms of molecular concentration of gelling agent in the nitrocellulose as modified by or in relation to number of molecules of gelling agent absorbed by the number of C_6 groups. Activities could also be measured from vapour tensions as functions of concentration.

In the vapour phase measure of absorption is easy, for it suffices merely to weigh the fibres before and after. In liquid medium the indirect method, of change of concentration of solution used for soaking the fibres, was adopted. Tests were made at a temperature of 40°C., and two or three weeks were allowed to elapse in order to be sure of an equilibrium stage. With gelling agents which are also good solvents, equilibrium is quickly attained. The X-ray diagrams were also obtained from the equilibrium state with the liquid or vapour at 40°C., using special thermostatic chambers. The type used for study in the vapour phase is described and illustrated, and reference made also to the work of McBain in 1933 on vapour absorption by nitrocellulose (*Trans. Far. Soc.*, 1933, *29*, 1086).

No True Combination

Absorption curves are shown for various solvents or gelling agents: ketones, esters, nitrates, and camphor. It is concluded that these studies of structure confirm earlier work; but whereas, hitherto, it has been supposed that there was some form of chemical combination, more recent work tends to indicate that, strictly, there is no real combination—even when there is a change in diagram—but merely a greater or less degree of penetration according to the nature and structure of the gelling agent which attaches itself to a greater or less

(*Continued overleaf*)

U.S. Chemical Prices

Only 16% Increase: Du Pont Chairman

WRITING in the "North American Supplement" to *The Financial Times* of November 3, Mr. W. S. Carpenter, jnr. (president of Du Pont de Nemours & Co.) says that production of industrial chemicals during the third quarter of the year had been at a rate of more than three times the 1935-39 average and even greater than the wartime peak figure. He says that there has been a broadening of public acceptance of products of chemical processes, and claims that if future expansion of U.S. chemical industry depended solely on solving technological problems and winning public approval for its products, the outlook would be bright. But restraints and uncertainties abound such as shortages of building materials, and high costs.

Between 1939 and 1947, wages in the industry have risen by more than 60 per cent, while the price index of the major raw materials rose by 132 per cent. Despite these rises, the price index of chemical products, he claims, rose by only 16 per cent. Mr. Carpenter attributes the relatively small advance in the price of products to "a general pricing policy of greater volume at prices consistent with reasonable reward for effort and the use of tools."

NON-FERROUS SCRAP

STOCKS of non-ferrous scrap metals at Sept. 30 in Ministry of Supply depots amounted to 48,823 tons, made up as follows:—S.A.A. Cases, 5010 (at July 31—2687); copper and copper alloy, 16,562 (at July 31—16,794); zinc and zinc alloy, 7117 (at July 31—6631); lead and lead alloy, 1156 (at July 31—1158); other grades, 18,978 (at July 31—19,201).

European Recovery

Accent on Fertilisers

A SPOKESMAN of the Economic Commission for Europe said in London last week (when describing the programme of the various committees now seeking solutions to Europe's recovery problems in Geneva) that the work of the Industry and Materials Committee was of especial importance. There are, he said, special subcommittees concerned with particular commodities such as fertilisers, alkalis, timber, etc.

A study is to be made of the capacity of fertiliser and alkali plants in order to recommend the final allocation of 400,000 tons of supplementary coal to be made by the European Coal Organisation for the first quarter of 1948. It is expected that most of this allocation will go to the production of fertilisers based on a survey of excess capacity.

PETROLEUM AND NITROGEN: U.S. SURVEY

U.S. exports of petroleum to Europe and elsewhere can be expected to decline somewhat over the next few years. As it becomes possible for us to do so, we can, if we choose, conserve our own oil resources by importing more petroleum for current consumption. The magnitude of such imports could exceed our present exports to Europe as to make the latter a negligible factor in the long-range conservation picture.

"Unless special measures are taken, American nitrogen capacity will expand only enough to keep pace with domestic requirements."—From the report of the Committee of U.S. Resources to President Truman on October 18.

GELLING OF NITROCELLULOSE—*(Continued)*

number of active groups in the n/cellulose.

This is shown by a certain continuity in the curves when passing from an extreme type—with a very good solvent like acetone—to one which, though attaching itself to certain parts of the structure to give an absorption curve, is nevertheless not a solvent at all like the long chain nitrates.

The ketones and esters attach themselves to all the groups, even those in the most crystalline parts, possibly changing even the form of the nucleus or nuclear region. In that event the smallest molecules become attached with the greatest ease, that is to say, under weaker tension and without the aid of a catalyst; while the nitrates probably attach themselves only to active groups or those more accessible in zones of irregular orientation.

The former are not only plasticisers but also solvents (excepting methyl acetate), so that it is possible to obtain a whole series of intermediate states with wide dispersion of chains; whereas the nitrates are not solvents.

Binary Mixtures

Although camphor may be regarded strictly as an intermediate case, it nevertheless belongs to the first category (of solvent-plasticisers) if assisted by a catalyst.

In the case of binary mixtures, such as the experiments in England with alkyl nitrates and alcohol whereby solvent power is considerably increased, these should be regarded as analogous to an ether/alcohol mixture, which is a solvent for dinitrocellulose only and does not produce any change of diagram. Further, there may be only partial solubility through some destruction of the fibres near the surface, but not through penetration into the deeper structure.

Sulphur's Rôle in Oil Refining

Persian Plants Approaching Self-Sufficiency

THE predominance of sulphur in many branches of chemical industry is so familiar that the full story of its ramifications as a key chemical has never fully been told. The importance of its rôle in the petroleum refining industry is a case in point. Much of the effort in refining petroleum is devoted to eliminating sulphur from petrol and burning oils. And the most potent agent for removing sulphur from oil is sulphuric acid.

Given those facts, it was inevitable that the close links between oil refining and sulphur production would produce valuable results in the advancement of techniques associated with sulphur chemistry, an outstanding example of which is provided by the Anglo-Iranian Oil Company's record in this sphere, the subject of an informative study in the current issue of the company's *Naft Magazine*.

First Sulphuric Acid Plant

The story began shortly before World War I when the small quantities of acid employed by the Anglo-Iranian Abadan refinery was brought from England.

Later, when the refinery had begun to expand and the cracking plants came into commission, the acid had to be used on such a large scale that importation was out of the question and a plant for making it from sulphur was installed in Abadan.

This plant, with an output of 30 tons a day, was built in 1930. Since then, to keep pace with the steady expansion of the refinery, five more plants of capacities up to 50 tons a day each have been built, and the figure for sulphuric acid production at Abadan now amounts to over 250 tons a day.

The smaller refineries at Alwand and Kermanshah also require sulphuric acid and have small plants for making it. There are various other uses for sulphur in Abadan which bring the total amount used up to nearly 2000 tons per month.

Crude oil from Masjid-i-Sulaiman contains in solution large quantities of sulphuretted hydrogen gas. Every 25,000 cu. ft. of H_2S contains a ton of sulphur. For many years, because there was no satisfactory process available for extracting the H_2S from the crude oil and the sulphur from the H_2S, all the sulphur required in Abadan was imported from Sicily and America.

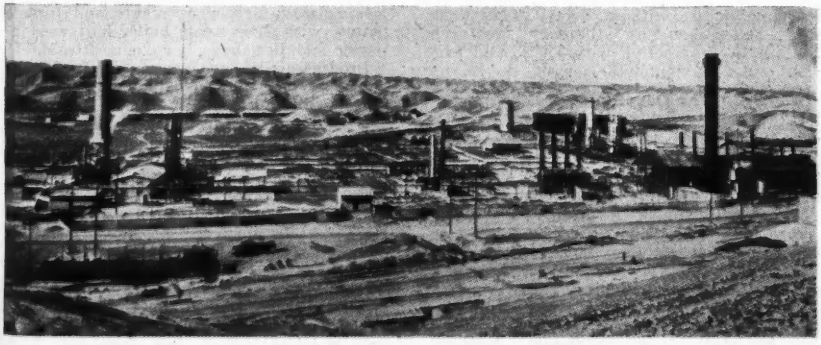
10 Tons Daily

During the 1930's, however, processes for separating H_2S efficiently from other gases were developed and in 1939 a plant for making 10 tons of sulphur daily was built at M.I.S., this being sufficient to supply Abadan's requirements at the time. The separation of H_2S was effected by scrubbing the fields gas with a liquid supplied under the trade name of "Alkacid," which absorbed H_2S very strongly when cold, released it again when warmed, and was then cooled again and returned to the absorbing vessel, thus making a continuous circuit.

The sulphur was obtained from the H_2S by a rather elaborate process which in essence was partial burning with a restricted air supply, whereby only the hydrogen in the H_2S was oxidised to water while the sulphur was released in the free state.

Since the plant was of German design and the "Alkacid" was a secret German product, the company was faced with a major problem to solve when war was declared and supplies were cut off. The

(*Continued overleaf*)



The Bibian sulphur plant (left) and the gas absorption plant at Masjid-i-Sulaiman

WIDENING SCOPE OF S.A. INDUSTRIES

NEW foreign markets have been opened up for South African tar and pitch, and the first shipment of 7000 tons was loaded in September at Durban for France, Algeria and Corsica in a French steamer. A number of smaller shipments have been exported since the war to Portuguese East Africa, but export on a large scale to the Continent from the Union has not hitherto been attempted. The tar comes from the South African Iron and Steel Industrial Corporation, Ltd., Iscor, the Government-sponsored steel industry which grew so swiftly during the war that a surplus of by-products has become available for export.

* * *

Morgan Crucible Co. (South Africa) (Pty.), Ltd., 7 Verwey Street, Troyeville, Johannesburg, is a new company which has just commenced the manufacture of carbon brushes and other carbon products, including contacts, carbon gland rings for steam turbines and carbon collectors and inserts, for which there is an increasing demand in many parts of the Union.

* * *

The Lever Brothers' factory in Durban, which now has a large output of vitaminised margarine, has been equipped with the latest machinery, largely of stainless steel. The company utilises the accumulated experience of its associate organisations overseas, where high-grade margarine has been made for many years.

* * *

Paint manufacturers are still experiencing considerable difficulty in securing raw materials. White pigment, one of the main raw materials normally obtained from the U.K. and the U.S.A., is extremely scarce; such quantities as are obtainable are highly priced. Despite the shortage, leading paint manufacturers still refuse to use substitute materials. They would rather lose business than lower the quality of their products, a policy that may well prove to be a wise one.

* * *

In order to keep abreast of new developments in the paint world generally, the local industry has formed a Paint Industries Research Institute, with headquarters at the Natal University College, Pietermaritzburg, Natal. An overseas expert is being engaged to take charge. It is the aim of the paint manufacturers to enable the local industry to produce paint equal in quality with any in the world. Valuable support is being given by the South African Bureau of Standards, which is helping lay down percentages of raw materials to be used in local manufacture. Another matter of concern is the price demanded by Argentine and Uruguayan suppliers for linseed oil, viz., 20s. to 23s. per gallon, as compared with 2s. 4d. to 2s. 6d. per gallon in pre-war days.

SULPHUR IN OIL REFINING—*(Continued)*

situation was made more serious by the fact that "Alkacid" also played an important function in the Abadan hydrogenation plant which at that time was the only plant in Abadan designed to manufacture high octane aviation spirit. It therefore became essential to discover the composition of "Alkacid" and to develop a process for its manufacture without delay. This work was undertaken by Sunbury Research Station in conjunction with I.C.I. and carried out with complete success.

War Developments

Towards the end of 1941 it was decided to erect in Abadan plant for the production of 600,000 tons per year of aviation spirit for the Allied Forces. Later the plant was expanded to make 1,100,000 tons per year.

This great project involved a major increase in the demand for sulphuric acid at Abadan, which in turn meant more shipments of sulphur from the U.S.A. at a critical period for shipping.

The problem was finally resolved by the erection of two sulphur recovery plants, each twice as big as the parent plant, at M.I.S. and Abadan, employing instead of "Alkacid," a solution of potassium triphosphate as a solvent. This reduced requirements of imported sulphur to small proportions.

Transportation of Sulphur in Iran

The greater part of the sulphur made from the oilfield gases is produced at Bibian, a part of the M.I.S. field where such installations as gas recovery plants and topping plants, with their steam boiler batteries and power supplies, have been concentrated.

Production of sulphur raised formidable transport problems in bridging the gap between Bibian and stores area. To improve this section it was decided to build an aerial ropeway which would economise both in distance and in the number of times the sulphur is handled. This ropeway itself represented a major engineering achievement.

The sulphur story—predicts the *Naft Magazine*—is not yet complete. Two new plants designed to recover used sulphuric acid for re-use in the refinery have been erected. The operation of these plants will result in great economy in the use of sulphuric acid and *ipso facto* of sulphur too. Soon sulphur imports into Iran will be a thing of the past.

Official Notices

Trade with Austria

THE Board of Trade announces that, following recent notification of the termination of the state of war with Austria, the following Orders have now been signed:

Trading with the Enemy (Authorisation) (Austria) Order, 1947. (S. R. & O., 1947, No. 2203.)

Trading with the Enemy (Transfer of Negotiable Instruments, etc.) (Austria) Order, 1947. (S. R. & O., 1947, No. 2204.)

Trading with the Enemy (Custodian) (Amendment) (Austria) Order, 1947. (S. R. & O., 1947, No. 2205.)

Full resumption of trade between the United Kingdom and Austria is now, therefore, permitted. It is pointed out, however, that money and property in the United Kingdom belonging to persons resident or carrying on business in Austria and income deriving therefrom, continue to remain under the control of the Board of Trade and Custodian of Enemy Property.

B.I.O.S. BECOMES T.I.D.U.

ALL inquiries regarding German and Japanese reports (which have hitherto been directed to B.I.O.S. at Bryanston Square, W.1), and applications to examine original documents (in the past addressed to Documents Unit, German Division, Board of Trade, Berkeley Square, W.1) are in future to be sent to a newly-formed centralising department—Technical Information and Documents Unit, German Division, Board of Trade, 40 Cadogan Square, London, S.W.1.

Experiments with Ammonium Nitrate

A re-estimation of the relative importance of the three chief chemical fertilisers was suggested in a paper presented by Dr. G. A. Cowie to the Agricultural Group of the Society of Chemical Industry. Experimental data, he said, had shown that nitrogen, such as sulphate of ammonia, was the essential soil requirement in this country and that the selective phosphate and potash fertilisers were needed only where specific deficiencies existed and then were best applied in small quantities with the seed. Response to a second dressing of 1 cwt. of sulphate of ammonia per acre was almost as great as to the first—2.2 cwt. of wheat—and an increased application of 1 cwt. of such nitrogen over present consumption could add 200,000 tons of wheat to our home supply.

Malayan Rubber Revival

Financial Assistance Recommended

IMPORTANT recommendations for increasing the efficiency of the Malayan rubber industry are contained in the first report issued by the Malayan Rubber Advisory Committee. The Malayan rubber industry is in urgent need of modernisation, and the report suggests that this can best be achieved by first providing financial assistance "up to four times the amount which a company is prepared to devote from its own sources for new planting." Such assistance should be the outcome of arrangements between the Malayan Union Government, the new Colonial Development Corporation, and possibly also Malayan banks.

Smallholders, the Committee recommends, should be assisted by the postponement of payment of premiums on new land, an 8-year period after planting being allowed to elapse. Supplies of high-yielding planting material should be made available to smallholders at cost price, and financial help is also suggested for the Malayan Rubber Research Institute.

GAS TO COST MORE

MR. J. R. W. ALEXANDER, general manager of the British Gas Council, estimates that 35 million gas consumers will be affected by an order, which came into force on Monday, of the Ministry of Fuel and Power, authorising gas undertakings to raise their prices to cover recent higher manufacturing costs consequent upon increased coal prices and the termination of Government subsidies on gas oil. Price increases are reported to be ranging from ¾d. to 1½d. per therm.

New Variant for D.D.T.

The production of a close analogue of DDT only slightly toxic to warm blooded animals is the claim made in the U.S.A. on behalf of the pest control research section of the Grasselli Chemicals branch of the E.I. Du Pont Company. The new insecticide, bis(methoxyphenyl)-trichloroethane, is stated to be one-fourth as toxic to men and animals as the more familiar dinitro formulation. The new material, which is as yet being produced only in small quantities, is stated to be more effective than DDT against flies, less lethal to codlin moth, but generally effective in controlling other fruit pests for which DDT is now used.

New Swedish Ores.—Copper-ore deposits with a high metal content have recently been discovered in Norbotten, Sweden. In addition, new iron-ore deposits have been found in the Västerbotten mountain range.

Next Week's Events

MONDAY, NOVEMBER 10

Society of Instrument Technology. College of Technology, Manchester, 7.15 p.m. Mr. S. S. Carlisle: "An Experimental Electrical Pressure Meter for Measurement of Furnace Roof Differential Pressures."

Royal Institute of Chemistry (Hull & District Section). The Royal Station Hotel, Hull, 7 p.m. M. L. Meara: "The Configuration and Polymorphism of Glycerides."

Royal Institute of Chemistry (Leeds Area Section). Chemistry Lecture Theatre, University of Leeds, 6.30 p.m. Annual General Meeting.

Oil & Colour Chemists' Association. Welfare Club, Messrs. British Paints, Portland Road, Newcastle-upon-Tyne, 6.30 p.m. Dr. R. F. Bowles: "A Coaxial Cylinder Viscometer of Wide Utility"; Mr. B. Saunders: "Brushability and the Empirical Flow Tests."

TUESDAY, NOVEMBER 11

The Institution of Chemical Engineers. Burlington House, Piccadilly, W.1, 5.30 p.m. Dr. T. A. Hall and Dr. G. G. Haselden: "The Purification of Gases in Low Temperature Processes"; Dr. M. Ruhemann: "The Ammonia Absorption Machine."

Royal Institute of Chemistry (London & S.E. Counties Section). Royal Clarendon Hotel, Gravesend, 7.30 p.m. Films and Discussion on "Water Treatment."

Society of Chemical Industry (Newcastle-upon-Tyne Section and Society of Glass Technologists). Chemistry Lecture Theatre, Kings College, Newcastle-upon-Tyne, 6.30 p.m. A. E. J. Vickers: "The Use of Photography as a Research Tool."

WEDNESDAY, NOVEMBER 12

Society of Chemical Industry (Food Group). Laboratories of Messrs. J. Lyons & Co. Ltd., Hammersmith Road, W.14, 6 p.m. Conversazione.

Institute of Fuel. Engineers' Club, Manchester 6.30 p.m. Dr. J. H. Bock: "Combustion of Low Grade Fuel with Special Reference to Continental Practice."

Society of Chemical Industry (Plastics Group). Gas Industry House, 1, Grosvenor Place, S.W.1. 2.30 p.m. Mr. S. R. Finn and Mr. L. R. Rogers: "A Method of Following the Phenol-Formaldehyde Reaction."

THURSDAY, NOVEMBER 13

Society of Dyers and Colourists (West Riding Section) Great Northern Victoria Hotel, Bradford, 7.15 p.m. Dr. A. Landolt: "Hydrophobic Melamine Compounds in Textile Processing."

FRIDAY, NOVEMBER 14

Society of Chemical Industry. Imperial Hotel, Birmingham, 6.30 p.m. Sir Hugh Chance: "Chance Memorial Lecture."

Institute of Welding (North London Branch). Manson House, 26, Portland Place, W.1, 7.30 p.m. Professor D. Hanson: "Training for Industry."

International Chemistry Exhibition.—In conjunction with the 21st International Congress of Industrial Chemistry, an international exhibition of pure and applied chemistry will be held at the Université du Travail Paul Pasteur at Charleroi in 1948. Chairman of the general executive committee of the exhibition is M. Albert Debecq, who is general manager of the S.A. de Produits Chimiques d'Auvelais, 3 rue de la Fenderie, Charleroi, Belgium.

Japanese Chemical Recovery

Continued Increase in Most Key Products

THE production of most chemicals continued to increase during April as a result of the improved fuel and power supply position, states Report No. 20 on Non-Military Activities in Japan, issued by General MacArthur's headquarters, a copy of which has just reached this country. The chief exceptions were chemicals dependent on fats and oils, stocks of which are nearly exhausted. Output of sulphuric acid was 124,560 metric tons, just sufficient to meet the present requirements of the fertiliser industry and, to a limited degree, those of other industries. Capacity to meet all needs is said to be available, but maldistribution of pyrites is restricting further output.

Post-War Peak

Increases are reported for the production of sodium products: production of caustic soda by the electrolytic process increased by 23 per cent. Output of calcium cyanamide at 18,923 tons was 43 per cent over the March figure and production of calcium superphosphate reached a new post-war peak of 47,517 metric tons. Ample quantities of Florida rock are said to be arriving.

Among coal-tar products, the total of crude benzene rose from 450 metric tons to 490 metric tons and it is stated that several plants started scrubbing coke gas during April to increase the quantity of crude benzene produced per ton of coal coked.

Output of dyestuffs rose from 149 metric tons in March to 198 tons in the month under review, this increase being chiefly due to a rise in the output of sulphur dyes from 91 to 126 tons.

Chrome, base and acid dye production rose, while production of direct dyes decreased. Production of phenol, aniline, chlorbenzene, nitrotoluene, phthalic anhydride and β-naphthol rose sharply from 73 metric tons to 228 metric tons. Production of acetylene derivatives showed a marked rise because of the improved supply of calcium carbide to the industry. Acetone output rose from 15 to 40 metric tons in April.

Minerals From Morocco. — Enhanced mineral production forms a substantial part of the rehabilitation of the French zone of Morocco, reported on by the Export Promotion Department of the British Consulate at Rabat. Average monthly production of lead is 1800 tons, against 1300 tons in 1946, and a lead smelting works has been established. Other noteworthy increases are iron ore, 30,000 tons exported in April, principally to the U.K., and 35,000 tons in May; cobalt 250 tons a month (140 tons in 1946); and manganese, production being increased from 8000 to 12,000 tons a month.

German Technical Reports

THE release of technical information, collected during the investigation of Germany's industrial processes has provided the following reports :—

BIOS 1459. German radio ceramics (30s.).

BIOS 1487. Chemical laboratory instrumentation in Germany (12s. 6d.).

BIOS 1521. Manufacture of white lead (2s.).

FIAT 817. Vertical mercury chlorine cells I.G. Farbenindustrie, A.G. (6s.).

FIAT 902. The production of crude and purified steroids in Germany (2s.).

FIAT 988. The production of acetylene by the partial combustion of methane (3s.).

FIAT 1051. The manufacture of monochlor acetic acid from trichlorethylene at I.G. Farbenindustrie, A.G., Hoechst am Main, Germany (1s. 6d.).

FIAT 1109. The production of polyvinyl acetals (2s.).

FIAT 1130. The manufacture of sintered magnets in the "Magnetfabrik Dortmund" of the Deutshe Edelstahlwerke A.G. Krefeld (2s. 6d.).

FIAT 1150. Further advances in the German ceramic industry (2s.).

BIOS 1522. Methyl cellulose production at Kalle and Co., Wiesbaden-Biebrich (8s.).

BIOS 1548. The manufacture of azo and lake dyestuffs at Hoechst, Ludwigshafen and Leverkusen (20s.).

BIOS 1554. German malleable iron foundries (with a note on Schenck fatigue machines) (9s.).

BIOS 1567. Manufacture of aluminium clad steel strip by Wickede, Eisen and Stahlwerke (1s. 6d.).

FIAT 656, 658, 659, 660, 662, 663. Rayon processing concerns in Germany (2s. 6d.).

FIAT 843. Chlorinated hydrocarbons from acetylene (6s. 6d.).

FIAT 875. Proposed ethylene oxide manufacture *via* oxidation of ethylene at Zweckel, near Gladbeck (7s. 6d.).

FIAT 892. Ceramic dielectrics for condensers (2s.).

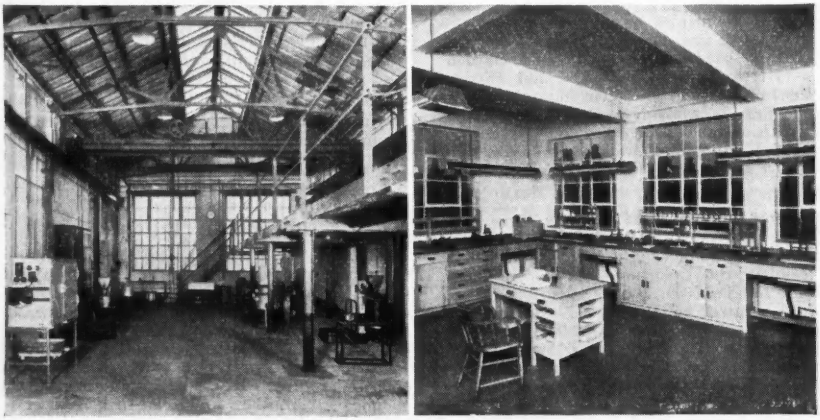
FIAT 998. Fluorobenzene manufacture (1s. 6d.).

FIAT 1001 (and Supplement No. 1). The synthetic stone industry of Germany (3s.).

FIAT 1166. Development of vinyl acetate copolymers at I.G. Farbenindustrie. Hoechst (1s. 6d.).

Private Research Centre for Chemicals and Dyes

Brotherton & Co., Ltd., manufacturers of chemicals and dyestuffs in the North of England since 1878, have opened a centralised research department at Leeds. The formal opening ceremony was performed by Mr. Chas. Brotherton, the chairman, on October 23. It is to serve the company's manufacturing centres at Birmingham, Leeds, Liverpool, Birkenhead, and Wakefield, and will be in the charge of Dr. Cule Davies. The new department comprises three large chemical laboratories, a workshop, a shed for pilot plant, as well as offices and a library.



The pilot plant house (left) and one of the three laboratories

Home News Items

Thirty-first Birthday.—Dunlop Rubber Co. celebrated its 31st birthday at Fort Dunlop on November 1. Its first week's wages bill amounted to £8 14s. 6d.

Chloroform Centenary.—The centenary of the discovery of chloroform anaesthesia by Sir James Young Simpson was celebrated in Edinburgh University on Tuesday. Professor R. J. Kellar presided at a scientific meeting attended by medical practitioners, and papers were read by Professor R. R. Macintosh, Dr. D. S. Middleton and Dr. John Gillies.

Light Industries Preferred.—Increasing shortage of young recruits for some chemical, metal and heavy industries was mentioned as a serious contemporary problem by Mr. L. V. Dunlop of Harland & Wolff, Ltd., speaking in Scotland recently. In the chemical industry, he said, young workers were generally reluctant to sign on where "dirty" or gaseous conditions prevailed and this shortage of workers was likely to increase.

New Light Source.—The research department of Messrs. Siemans electric lamp factory at Preston, has developed a new source of light for use in photography. A development of a wartime invention it is termed the "gas arc," and has the advantage of continuous as well as instantaneous emission. Radiation is produced by conducting electricity through xenon gas at very high current densities.

Chemical Group's War Memorial.—A memorial commemorating the 44 employees of British Glues and Chemicals, Ltd., and associated companies, who gave their lives in the war, was unveiled recently at the company's head office in Welwyn Garden City, Hertfordshire. Relatives and friends of the fallen, who came from many branches of the firm between Newcastle-on-Tyne and Plymouth, attended the ceremony as guests of British Glues, as well as the directors and staff from all the company's establishments.

Aid for Cholera Areas.—At the Liverpool factory of Evans Medical Supplies, Ltd., millions of doses of vaccine has been prepared to combat the epidemics of cholera now raging in Pakistan and Egypt. Every medical centre in Britain is contributing supplies. Employees at medical research centres and distributing chemists have worked overtime and at the week-ends packing supplies, and it is estimated recently that over two and a half tons of vaccines, plasma and other treatments, including new sulphur drugs, had left this country by air.

James Watt Bursaries.—The widow of the late Dr. James Watt has offered the sum of £5000 to the University Court of Edinburgh University. The offer has been accepted, and the income derived therefrom is to provide bursaries for students proceeding to an honours degree in chemistry.

Coal: Best Since May 3.—Collieries and open-cast coal workings produced last week a greater tonnage—4,090,000—than in any week since May 3. This figure contrasts with 3,917,500 tons in the previous week and brings the total for the year to 163,752,200 tons against 158,800,100 tons this time a year ago.

New Factory.—This is an example of the drift north, said Mr. D. L. Hall, general manager of Messrs. Mirrlees (Engineers), Ltd., when he welcomed a number of guests on October 31, to the firm's new factory on the Hillington Industrial Estates, Glasgow, where the firm is concentrating on the production of the rotary positive displacement pump, which had been designed to deal with a wide range of liquids having lubricating qualities. There are orders on hand for more than a year's work.

Dunlop Executive's Tip to Advertisers

"I believe that many advertising managers would find a greater use of the periodical and magazine field to be productive in these days of austerity," Mr. H. W. Eley, Dunlop's general advertising manager, told the Regent Advertising Club, London, last week. "It is needless for men to emphasise the long life of many periodicals and magazines or the loyalty of their readership; but these are factors which the advertising manager, operating in these lean years, should bear well in mind."

Dollars for Patents

Mr. H. A. P. Disney, BETRO director of administration, has written to THE CHEMICAL AGE to say that he is in communication with "a well-known American firm" which is anxious to enter into a "know-how" agreement with a British firm manufacturing coal-tar intermediates, aromatic chemicals, fur dyes, and photographic chemicals. Another American firm is interested in synthetic and natural rubber-based products suitable for cloth-backed fabrics.

PERSONAL

Chemical Society's Secretary

MR. L. R. BATTEN has resigned the general secretaryship of The Chemical Society to take up an appointment with Shell Petroleum Co. He will work in the patents section of the company's industrial development management department (THE CHEMICAL AGE, August 30) as assistant to MR. A. E. KOELEMAN. Mr. Batten is succeeded at Chemical Society by MR. J. RUCK KEENE, who was executive assistant in charge of the Society's recent centenary celebrations in London.

Mr. L. R. Batten

Sheffield University Appointments

Recent appointments at Sheffield University include the following: DR. A. S. C. LAWRENCE, senior lecturer in physical chemistry; DR. H. J. TRESS, lecturer in glass technology; MR. DOUGLAS W. RILEY, assistant lecturer in chemistry.

The following were appointed officers for the 1947-48 Session at the annual general meeting of the Northampton Group of the International Society of Leather Trades Chemists: *President*, D. WOODROFFE; *chairman*, P. STANLEY BRIGGS; *vice-chairman*, J. S. MUDD; *treasurer*, F. O. BERRILL; *secretary*, F. W. HANCOCK; *member of committee*, G. H. TWEDDELL.

Journalist Honoured

Representatives of industry and of journalism from many parts of the country and from overseas were present at a luncheon at Grosvenor House, London, on Monday, given by the directors of Benn Brothers, Ltd., proprietors of THE CHEMICAL AGE, to MR. NORMAN FRENCH, managing director and editor of *The Timber Trades Journal*. Mr. E. Glanvill Benn (chairman) presided at the function, which commemorated Mr. French's service with the company extending over nearly 30 years. Major W. Newland Hillas, president of the Timber Trade Federation of the United Kingdom, proposed the health of the guest, and Sir Ernest Benn supported and on behalf of the firm and staff presented to Mr. French a handsome bookcase and a desk.

PROF. J. A. S. RITSON has been elected president of the Institution of Mining Engineers for the year 1948-49 in succession to Prof. Douglas Hay.

I.C.I's. New Research Director

MR. C. PAINE has been appointed research director of I.C.I. Dyestuffs Division, in succession to MR. J. BADDILEY, who retired on September 30. Mr. C. Paine joined Levinstein, Ltd., in 1917, as a laboratory assistant, and graduated with honours in Chemistry, London External, in 1924. He has concentrated on dyestuffs and their intermediates throughout most of his career. In 1935 he was seconded to Professor Traube at Edinburgh University for a few months, and during the following four years, specialised in the handling of technical patents, spending some time in the company's New York office. He was appointed to the board of Imperial Chemical (Pharmaceuticals), Ltd., in 1945. Mr. Baddiley, a pupil of Professor Green's at Leeds University, played an important rôle in putting British dyestuffs on the map. His achievements were recognised by the award of the Perkin Medal by the Society of Dyers and Colourists in 1939.

MR. J. L. GRAHAM, Dunlop Rubber Co.'s director of overseas sales, has resigned owing to ill-health. Mr. Graham is a director of the Dunlop companies in India, South Africa and New Zealand and of many other associated companies overseas. He will remain available as a consultant. SIR ANDREW R. DUNCAN, MR. J. H. LORD, and MR. A. R. MACKAY GEDDES, have been appointed to the board.

MR. SAMUEL BODLENDER has been appointed chairman of United Lubricants, Ltd. Mr. Bodlender was formerly secretary of the Standard Life Insurance Company.

Obituary

LORD FORTEVIOT, chairman of the Distillers Company and a director of John Dewar & Sons, Ltd., has died at Dupplin, near Perth. He was 62.

The death occurred on October 30, at Cambuslang, of MR. WALTER JOHN BUCHANAN, of Buchanan Chemical Company, 18 Watson Street, Glasgow. Mr. Buchanan, 46 years of age, had been a partner of the firm since its foundation 24 years ago.

PROF. DR. RUDOLF NEURATH, who died on October 15 in New York at the age of 78, was until 1938 Professor of Children's Medicine at the University of Vienna. He was also very active in the field of pharmaceutical chemistry. He was a brother of THE CHEMICAL AGE contributor—Dr. Frederic Neurath.

Overseas News Items

U.S. to Increase Propane Production.—In view of the importance of propane in the manufacture of chemicals based on petroleum, Philipps Petroleum Co. and the Atlantic Refining Co. are to construct a modern propane plant in Philadelphia.

Better Fuel Supplies in Italy.—Cement industry in Italy has achieved a current output often exceeding 80 per cent of the pre-war production rate, and by the spring of next year all demands that the reconstruction programme may make upon it will be satisfied.

Tin Mine Abandoned.—Mount Bischoff, in Tasmania, formerly the richest tin mine in the world, the re-opening of which during the war has proved uneconomic, is to be sold at auction. Shareholders received £3,000,000 in dividends before mining was abandoned ten years ago.

Less U.S. Coal-Tar. — According to figures published by the U.S. Tariff Commission, output of coal tar totalled 837 million gallons in 1946, a decline of 62 million gallons on 1945. Benzene production fell from 156 million gallons to 135 million gallons and that of naphthalene from 288 million gallons to 242 million gallons.

Italian Metals and Chemicals.—Increases in the output of metal alloys in the first five months of the year have been reported from Italy. Production figures are said to be 21,850 tons compared with 7333 for the same period last year. The chemical industry also reports satisfactory production developments. Against a monthly average of 8770 tons of caustic soda produced during the last quarter of 1946 the July figures for this year were 9257 tons. Electrolytic soda production increased from 1117 tons to 1484 tons while that of chlorine-hydrogen rose from 2698 to 3181 tons.

Austrian Copper Foundry Output.—The Brixlegg copper foundries which were incapacitated by bomb damage have begun work again. Under normal peacetime conditions these foundries supplied not only the biggest part of the country's requirements of electrolytic copper, copper sulphate, and copper for rolling, moulding and forging, but also melted copper scrap brought from South Germany, Czechoslovakia, Hungary and Northern Italy. Production in 1944 amounted to 4600 tons of electrolytic copper and 3000 tons of copper sulphate. At the end of the war stocks were piled high and French occupation authorities were able to seize 18,000 tons of copper and copper sulphate.

No More Oil Concessions.—The Persian Parliament, deciding recently to scrap the oil agreement effected with the Soviet Ambassador in 1946, agreed to forbid the granting of any further foreign oil concessions.

New French Alloy.—According to the U.S. Bureau of Mines, French metallurgists have produced a new aluminium alloy—"Zincral"—containing the following percentages: zinc, 7 to 8.5; magnesium, 1.75 to 3; copper, 1 to 2; chrome, 0.1 to 0.4; manganese, 0.1 to 0.6; iron and silica, 0.7.

Norwegian Steel Plan.—Norway plans to erect a modern rolling mill in North Norway with an initial output of about 200,000 metric tons a year. Domestic steel manufacture at present supplies only a fraction of the country's annual requirements of about 3-400,000 metric tons.

Record Coal Output.—Poland's September coal output of 5,360,000 metric tons represents a new record and exceeds the planned figure by about three per cent. Output for the first nine months of the current year—42,700,000 metric tons—exceeded the plan by about 500,000 metric tons.

More Argentine Petroleum.—Official statistics, show that production of petroleum in Argentina during the first six months of 1947 was as follows: State-owned wells 1,161,183 cu. m.; privately-owned wells 516,892 cu. m. These figures, compared with last year's, indicate that the decline in output, which was attributed mainly to the shortage of oil-drilling machinery, has been checked.

Thos. Ward Expansion.—As part of a programme for expanding its export trade Thos. W. Ward, Ltd., Sheffield, has established a subsidiary undertaking under the designation Thos. W. Ward (Belgium) S.A., with offices at 8 Longue Rue des Claires, Antwerp. The local director in charge of operations is Mr. Jan Bronkhorst, and his field of activity covers the territory of Belgium, Holland and Luxembourg.

Coal Gas Enrichment.—A German process for enriching coal gas to render it suitable as a motor fuel is described in a report by the Office of Technical Services, Department of Commerce, Washington. The process, which involves the catalytic synthesis of methanes from the carbon monoxide and hydrogen constituents of the gas, was developed by the German firm Ruhrchemie A.G., the synthesis reaction being conducted over a nickel catalyst.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

GLYSAN PRODUCTS, LTD., London, E.C., manufacturing chemists, drysalters, etc. (M., 8/11/47.) September 30, debenture, to Martins Bank Ltd., securing all moneys due or to become due to the Bank; general charge. *—. January 1, 1946.

NORTH BRITISH ALUMINIUM CO., LTD., London, E.C. (M., 8/11/47.) October 7, disposition by Royal Bank of Scotland with consent granted in implement of a trust deed dated July 30, 1947; charged on certain property at Inverlochy, Kilmonivaig, and fixtures, etc. *—. March 25, 1947.

Satisfaction

LONDON TESTING LABORATORY, LTD., Monks Risborough. (M.S., 8/11/47.) Satisfaction September 26, £950, registered March 19, 1941.

Company News

Murex, Ltd., announces a net trading profit for the year of £294,313, an increase of £142,725 over the previous year.

The nominal capital of **Vulcan Chemical Co.,** " Braemar," Cleckheaton, has been increased beyond the registered capital of £5000, by £625 in £1 ordinary shares.

The nominal capital of **Ketarome, Ltd.,** manufacturers of aromatic hydrocarbons and compounds, olefins, ketones and petroleum products, 95a Chancery Lane, London, W.C.2, has been increased beyond the registered capital of £500, by £1500, in 6000 shares of 5s.

Erinoid, Ltd., manufacturers of plastics, made a net profit of £67,624 in the year ended July 31, 1947. This compares with £22,257 for the previous year. A dividend of 20 per cent (including 5 per cent bonus) has been paid on the ordinary shares (1946 10 per cent).

Wade Potteries, Ltd., and subsidiary companies report a net profit of £32,688 for the year ended July 31, 1947. Dividends amounting to £8195 are recommended, viz.: £1320 preference dividends, the balance being in respect of 25 per cent payments on the ordinary shares.

New Companies Registered

Norma Chemicals, Ltd. (444,123).—Private company. Capital £1000 in 1000 shares of £1 each. Manufacturers, wholesalers and retailers of fine chemicals and pharmaceutical articles, etc. Subscribers: G. L. Lefson and H. L. Berlak. G. L. Lefson is the first director. Registered office: 112/4 Cannon Street, E.C.4.

Interfusion, Ltd. (444,105).—Private company. Capital £5600 in £1 shares. Manufacturers and dealers in products incorporating plastic or composition substances, including flooring materials, building materials, etc. Directors: I. P. Andren, G. S. F. Barham, G. B. E. Schueler and Mrs. Elizabet M. Schueler. Registered office: 66 Fenchurch Street, E.C.3.

Distillers Company (Biochemicals), Ltd. (443,853).—Private company. Capital £1000 in 100 shares of £1 each. To acquire and operate factories, works and plant for the manufacture of penicillin, streptomycin and other antibiotic compounds, malt, yeast, vitamins and any other pharmaceutical, medicinal and chemical compounds or preparations, etc. Subscribers: E. Barnes and W. Neil Holgate. Registered office: Fleming Road, Speke, nr. Liverpool.

British Petroleum Chemicals, Ltd. (443,602).—Private company. Capital £100 in £1 shares. To manufacture, treat and turn to account chemicals, whether derivatives or compounds of petroleum, natural gas, or shale oil, or of any other nature, etc. Directors: R. Crichton, J. A. Jameson, F. G. C. Morris, N. A. Gass, T. F. A. Board, L. A. Elgood, C. G. C. Hayman and E. Stein. Registered office: 21 St. James' Square, S.W.1.

United Kingdom Chemicals, Ltd. (444,130).—Private company. Capital £250,000 in £1 shares. Manufacturing chemists, manufacturers of chemical and allied products and substances, coke, tar and gas producers, coal and tar distillers, refiners and treaters of coal and other minerals and their derivatives and tar and other products, refiners and treaters of oils, etc. Subscribers: D. G. Bosanquet, and Wm. J. Gurney. Solicitors: Slaughter & May, 18 Austin Friars, E.C.2.

Chemical and Allied Stocks and Shares

CHEERED by the results of the Municipal Elections, stock markets were more active with values in most sections on the up-grade, although best levels were not held, caution prevailing in view of the forthcoming interim Budget. Money-seeking investment went mostly into British Funds, the further gains in which stimulated leading industrial shares. The better tendency in industrials was due in part to wider re-

cognition that even if the Profits Tax were doubled it would in many cases be possible to maintain dividends, although this would necessitate allocations to reserve funds on a smaller scale than in recent years. Moreover, it is being pointed out that should the rise in gilt-edged be on a scale which places 2½ per cent Consols and Treasury Bonds within sight of par, the yield on British Funds would be so small that there would be a strong revival in higher-yielding equity or ordinary shares.

Chemical and kindred shares have reflected the prevailing market tendency, with Imperial Chemical up to 47s. 9d. Greeff-Chemicals Holdings 5s. ordinary were 15s., and B. Laporte 81s. 3d. W. J. Bush were 82s. 6d., and Fisons 64s. 4½d. Glaxo Laboratories have rallied to £18, it being pointed out that the company derives considerable benefit from the end of E.P.T. at the beginning of this year and that this must be reflected in financial results even if the Budget were to double the Profits Tax. In other directions, British Glues & Chemicals 4s. ordinary have been firm at 18s. 9d., and after easing to 27s. the units of the Distillers Co. rallied to 27s. 9d., United Molasses were 47s. 6d., and British Plaster Board 23s. 1½d. Turner & Newall 71s. 6d., Dunlop Rubber 69s. 3d., Courtaulds 43s. 9d., and British Oxygen 93s. 9d. all moved higher, but the best section was provided by iron and steels where sentiment benefited from renewed hopes that nationalisation of the industry may be shelved indefinitely. Dorman Long rose to 27s., Guest Keen to 47s. 7½d., United Steel were good at 26s. 3d., with Stewarts & Lloyds 51s. 9d., Thomas and Baldwins 13s. 3d., Ruston & Hornsby 63s. 3d., Colvilles 27s. 4½d., and Allied Ironfounders 51s. T. W. Ward at 45s. 6d. also reflected the upward movement. In most cases iron and steel shares still offer yields well in excess of the average on industrial securities, and the market view is that there are extremely good prospects of dividends being maintained. Moreover, it is being pointed out that even if nationalisation were forced on the industry, the compensation for shareholders, if fair and equitable, would have to be on a basis justifying higher share prices than those now ruling.

British Aluminium improved to 45s. 9d., General Refractories have been favoured up to 45s. 9d., and Lever & Unilever strengthened to 50s. 9d. Beechams deferred at 21s. 9d. were also better, reflecting hopes that the London Metal Exchange may be reopened next year. Amalgamated Metal shares improved to 17s. 3d., Paint shares also moved with the general trend, International Paint being better at £6¼, with Pinchin Johnson 54s. 6d., and Goodlass Wall 36s. 3d. In other directions, Borax Consolidated deferred displayed firmness at 51s. 9d. Gas stocks and shares were firmer on the suggestion that nationalisation may be postponed, although it is generally feared the Government intends to proceed with its plans. Gas Light & Coke were 20s., and South Met. Gas ordinary stock 39s. Oil shares receded, although pending the financial results, Lobitos improved to 66s. 3d. Shell fluctuated around 77s. 9d. awaiting terms of the expected big £30 million issue which it is rumoured may take the form of one new share at £3 for every three held.

British Chemical Prices

Market Reports

THERE has been no outstanding feature on the industrial chemicals market during the past week and conditions generally remain unchanged with the demand continuing in excess of supply. No important changes in quotations have been reported and the undertone in most sections is very firm. The demand for shipment has been well maintained but actual bookings have been restricted by the prior needs of the home market. This particularly refers to such items as the bichromates, calcium carbide, formaldehyde, soda acetate, citric, formic and oxalic acids. There has been a good call for bleaching powder, sal ammoniac and arsenic, whilst the lead oxides continue in active request. The coal tar products market remains unchanged, with the demand both for home and export account much in excess of offers. Pitch is an active market.

MANCHESTER.—Plenty of business has been on offer on the Manchester chemical market during the week, although in a number of instances there has been evidence of buyers being more anxious to buy than sellers are to sell. This seems to arise partly from the tight supply position and is intensified by prevailing uncertainties. There is a continued steady flow of delivery specifications for textile and other industrial chemicals, and shippers have again been in the market with inquiries covering a fairly wide range. A steady absorption of supplies of most of the light and heavy materials remains a feature of the tar products section.

GLASGOW.—Quiet conditions have prevailed for a week in the Scottish heavy chemical market, although there has been a heavy demand for materials for the paint trade. In the export market, inquiries continue unabated and a few orders have again been booked. There has been a noteworthy demand from overseas for zinc chloride and for one or two other materials for which supplies are available. Import licences in Spain are still difficult to obtain and where shipment is not effected in time it is practically impossible to get a renewal of the import licence.

Patents in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted may be obtained from the Patent Office, Southampton Buildings, London, W.C.2., at 1s. each.

Complete Specifications Open to Public Inspection

Laminated articles.—N.V. de Bataafsche Petroleum Maatschappij. Feb. 7, 1944. 21742/1947.

Process for the production of convertible alkyd resins.—N.V. de Bataafsche Petroleum Maatschappij. Sept. 14, 1945. 21743/1947.

Compounded lubricating oil.—N.V. de Bataafsche Petroleum Maatschappij. May 1, 1945. 21744/1947.

Hydrogenation of polyallyl alcohol.—N.V. de Bataafsche Petroleum Maatschappij. Sept. 14, 1943. 21745/1944.

Preparation of lead salicylates and mixtures containing the same.—National Lead Co. Oct. 20, 1942. 12837/1944.

Method of preparing pectic substances of high molecular weight.—H. Pallmann, and H. Deuel. Feb. 26, 1946. 4262/1947.

Method of improving the water-solubility of pectic substances.—H. Pallmann, and H. Deuel. Feb. 26, 1946. 4263/1947.

Hydrogen peroxide bleach.—Pennsylvania Salt. Mftg. Co. Sept. 26, 1942. 21486/1947.

Storing and shipping hydrogen peroxide.—Pennsylvania Salt Mftg. Co. March 17, 1943. 21487/1947.

Process of producing magnesium hydroxide and magnesium oxide and products resulting therefrom.—Permanente Metals Corporation. July 18, 1944. 21385/1947.

Process of producing magnesium hydroxide and magnesium oxide and products resulting therefrom.—Permanente Metals Corporation. July 15, 1942. 21386-87/1947.

Anodising aluminium.—Reynolds Metals Co. Feb. 27, 1946. 443/1947.

Process for the manufacture of pentenes.—Roche Products, Ltd. Feb. 27, 1946. 5529/1947.

A process for the manufacture of arabonic acid derivatives.—Roche Products, Ltd. March 30, 1945. 21438/1947.

Imidazolene compounds and process for manufacture of same.—Roche Products, Ltd. July 30, 1945. 21524/1947.

Compositions of matter.—Roche Products Ltd.—Sept. 25, 1945. 21525/1947.

Process for the manufacture of dl-2^1—keto—3, 4—imidazilido tetrahydrofurane—(2)—N—valaric acid and intermediates therefor.—Roche Products, Ltd. July 30, 1945. 21526/1947.

Diazine compounds.—Sharp & Dohme, Inc. Aug. 2, 1939. 21674-75/1947.

Physiologically active substances.—Sharp & Dohme, Inc. Jan. 9, 1940. 21676/1947.

Therapeutically active preparation.—Sharpe & Dohme, Inc. Oct. 18, 1939. 21677/1947.

Barbituric acids.—Sharp & Dohme, Inc. March 23, 1939. 21763/1947.

Fuelling of internal-combustion engines.—Shell Development Co. March 27, 1944. 12459/1945.

Penicillin extraction process.—Shell Development Co. June 19, 1944. 14074-75/1945.

Production of manganous salts.—F. L. Smidth & Co., A/S. Feb. 28, 1946. 5734-35/1947.

Process for the recovery of sulphuric acid from acid sludge.—Standard Oil Development Co. Dec. 28, 1943. 21678-79/1947.

Process for the production of olefins.—Standard Oil Development Co., and Rohm & Haas Co. Nov. 22, 1940. 218/1943.

Refining and decolorising glycerine oils.—Synergic Foundation, Inc. Dec. 8, 1939. 21390/1947.

Process for producing alkylated aromatic hydrocarbons.—Universal Oil Products Co. Feb. 20, 1939. 21346/1947.

Process for the catalytic conversion of hydrocarbon oils.—Universal Oil Products Co. Aug. 14, 1939. 21347/1947.

Process for the dehydrogenation of hydrocarbons.—Universal Oil Products Co. Aug. 12, 1940. 21348/1947.

Process for the production of alkyl aromatic hydrocarbons.—Universal Oil Products Co. March 16, 1942. 21349/1947.

Process for the recovery of hydrocarbons from sludge.—Universal Oil Products Co. March 31, 1943. 21350/1947.

EDUCATIONAL

PATENTS & TRADE MARKS

SITUATIONS VACANT

None of the vacancies in these columns relates to a man between the ages of 18 and 50 inclusive, or a woman between the ages of 18 and 40 inclusive, unless he or she is exempted from the provisions of the Control of Engagement Order, or the vacancy is for employment exempted from the provisions of that order.

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